CHAPTER 5

JP-5 AFLOAT FLIGHT DECK SYSTEMS AND OPERATIONS

Working the flight deck of an aircraft carrier is one of the most exciting and dangerous jobs you can have. Additionally, the ABF works with highly flammable fuels. Though the below decks system is more complex, the ABF working on the flight deck must be equally knowledgeable in the flight deck system, its components, and correct operating procedures.

This chapter will identify the components used for flight and hangar deck operations and explain the correct operating procedures. As with below decks, the arrangement of the flight deck system will vary from ship to ship. The information in this chapter is based on typical arrangements.

JP-5 FLIGHT DECK SYSTEM COMPONENTS

LEARNING OBJECTIVES: Identify the components that make up the JP-5 flight and hangar deck fueling system. Describe their function and principles of operation.

The flight and hangar deck fueling system is built around the Cla-Val fueling unit. The number and location of these units depend on the individual ship. Typically, each refueling station contains three or four hose reels, each having its own Cla-Val.

In this section, we will identify and describe the components in the flight and hangar deck JP-5 system.

CLA-VAL FUEL/DEFUEL VALVE

The CLA-VAL fueling unit (fig. 5-1) is the core of the JP-5 fueling station. It is a three-port, two-way, fuel/defuel valve, of modified globe valve design that is intended for use as an integral part of the JP-5 dispensing system for shipboard use. This valve performs four distinct functions:

1. It functions as a pressure-reducing valve to maintain a constant discharge pressure not to exceed 55 psi.

2. It functions as a solenoid-operated emergency shutoff valve.

3. It functions as a pressure-relief valve when discharge pressure rises above a predetermined setting.

4. It functions as a defueling valve to evacuate the piping and hose beyond the valve discharge.

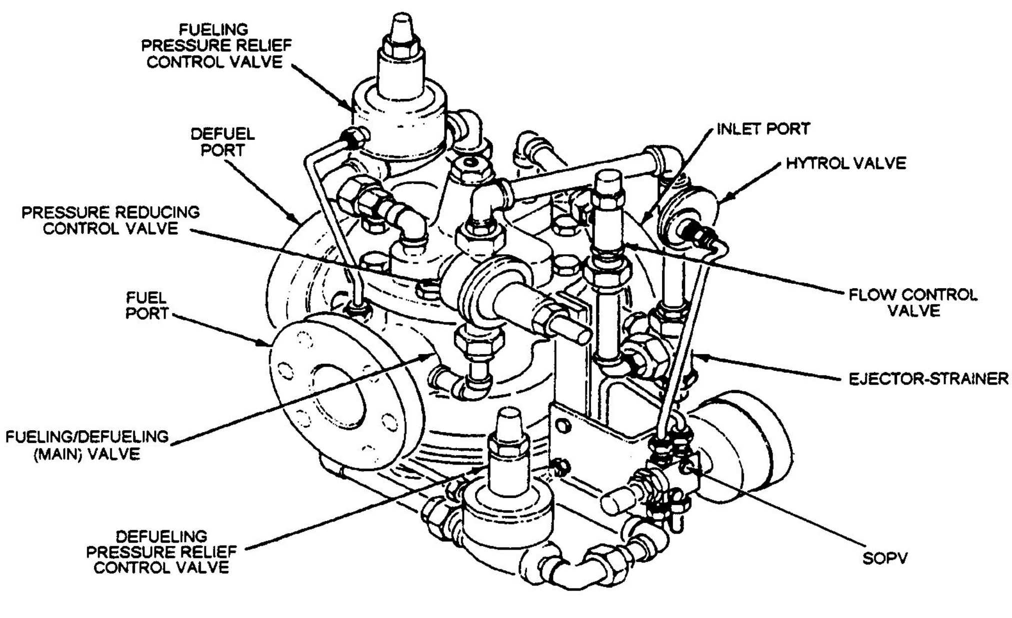
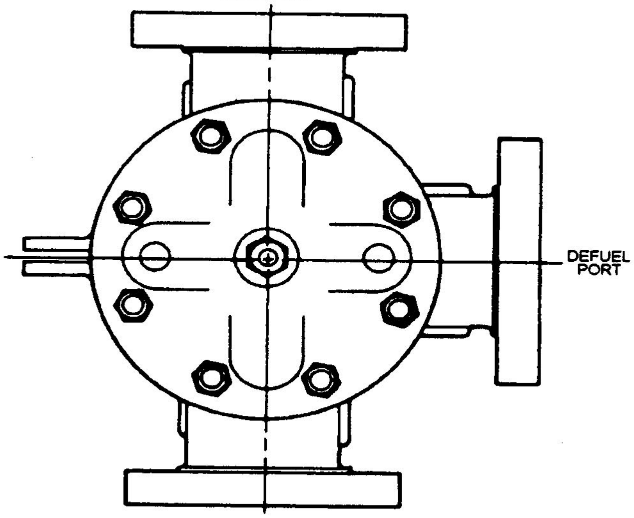


Figure 5-1.—Cla-Val fuel/defuel valve assembly.

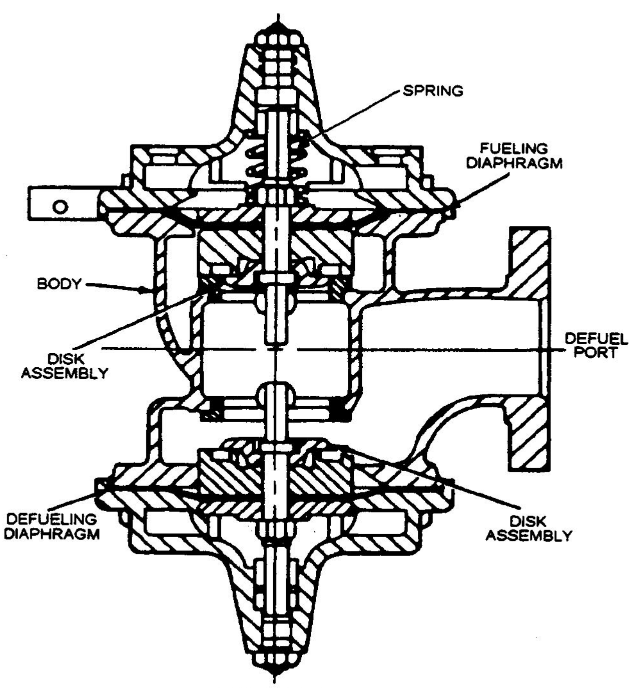
Main Fuel/Defuel Valve

The main valve (fig. 5-2) is actually two single-seated globe valves built into a common body. Each of the valves performs a separate and distinct function, one is the fueling valve and the other is the defueling valve.

Each valve employs a well-supported and reinforced diaphragm as its operating means. The fueling valve is spring-loaded to close; therefore, it is normally closed. The defuel valve is inverted (upside down) and held open by its own weight.



TOP VIEW



SIDE VIEW

Figure 5-2.—Main valve.

The main valve directs fuel flow from the inlet port to the fuel port when fueling, and fuel flow from the fuel port to the defuel port when defueling. The fuel and defuel valves are controlled by pressure acting on a diaphragm. The change from the fuel to defuel mode is accomplished by energizing or deenergizing the solenoid-operated pilot valve (SOPV), or by excessive delivery pressure.

When pressure above the fueling valve diaphragm is vented off, inlet pressure on the diaphragm lifts its disk assembly, opening the fuel valve. Simultaneously, pressure is applied to the bottom of the defueling valve diaphragm, seating its disk assembly and closing the defuel valve.

When pressure underneath the defueling valve diaphragm is vented off, its disk assembly falls, and the defuel valve opens. Simultaneously, pressure is applied to the top of the fuel valve diaphragm (both line and spring). When this pressure overcomes the inlet pressure, its disk assembly seats, closing the fuel valve.

The main valve is controlled by a set of smaller valves using line pressure, thus providing fully automatic operations. The SOPV shifts the Cla-Val assembly from defueling to fueling, and from fueling to defueling. The flow control valve regulates the opening speed of the fueling side of the main valve. The hytrol valve either isolates inlet pressure from the pressure-reducing control valve, or vents inlet pressure to the pressure-reducing control valve and the fuel port of the main valve. The pressure-reducing control valve regulates delivery pressure. The ejector-strainer aids in relieving pressure above the diaphragm of the fueling valve and prevents foreign particles from entering the pressure-reducing control valve. The pressure relief control valves open to shift to the defueling mode if the delivery pressure exceeds the preset limit.

Pressure Relief Control Valves

The pressure relief control valves (fig. 5-3) open to shift the main valve to the defueling mode when delivery pressure exceeds the preset adjustment. There are two pressure-relief control valves for each Cla-Val fueling unit. One valve acts as a pressure

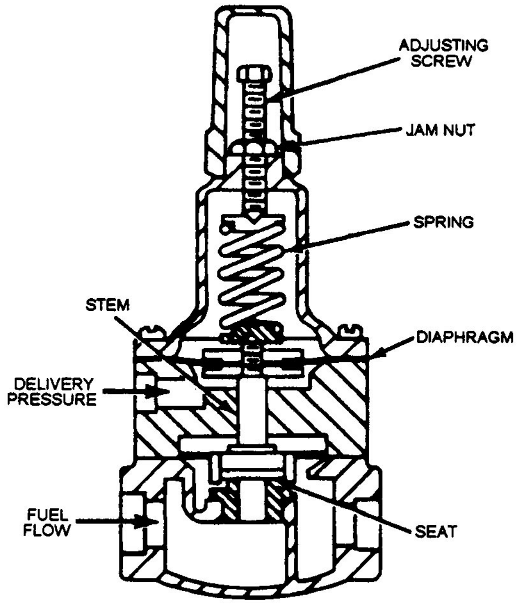


Figure 5-3.—Pressure-relief control valve.

relief for the fuel valve, and the other for the defuel valve.

Each pressure-relief control valve contains a stem, a diaphragm, a spring, and an adjusting screw. Each valve is a direct acting, spring-loaded valve, designed with a large diaphragm working area in relation to the valve area seat, to ensure positive operation. It is held closed by the force of the compression spring. Pressure adjustment is made by rotating the adjusting screw to vary spring compression on the diaphragm. Compressing this spring increases the pressure at which the valve opens. The spring can be adjusted to provide a relief setting from 20 to 70 psi. The adjusting screw is covered by a protective housing.

When the controlling pressure under the diaphragm exceeds the set spring force, the disk is lifted off the seat, permitting flow.

The pressure relief for the defuel valve is set about 7 1/2 psi above delivery pressure. The pressure relief for the fuel valve is set approximately 2 1/2 psi above delivery pressure. The opening of the pressure relief control valve for the fueling valve increases the closing speed of the fueling valve. The opening of the pressure relief control valve for the defueling valve vents pressure from the bottom of the defuel valve diaphragm, opening it.

Pressure-Reducing Control Valve

The pressure-reducing control valve (fig. 5-4) steadily reduces a higher initial pressure to a lower pressure and regulates the delivery pressure when the main valve is in the fueling mode.

The pressure-reducing control valve is a direct acting, spring-loaded valve designed with a large diaphragm working area in relation to the valve seat to ensure sensitive control and accurate regulation of the delivery pressure. Pressure adjustment is made by rotating the adjusting screw to vary spring compression on the diaphragm. Compressing this spring in-creases the delivery pressure setting. The spring can be adjusted to provide delivery from 15 to 100 psi. The adjusting screw is also covered by a protective housing.

The pressure-reducing control valve normally is held open by the force of the compression spring. When the delivery pressure acting upon the lower side of the diaphragm exceeds the force of the compression spring, the valve closes.

Conversely, when the delivery pressure reduces below the spring setting, the valve opens. Thus, a constant delivery pressure is maintained by balancing delivery pressure against spring pressure. The valve can be easily regulated by turning the adjusting screw, which provides a simple means of pressure adjustment.

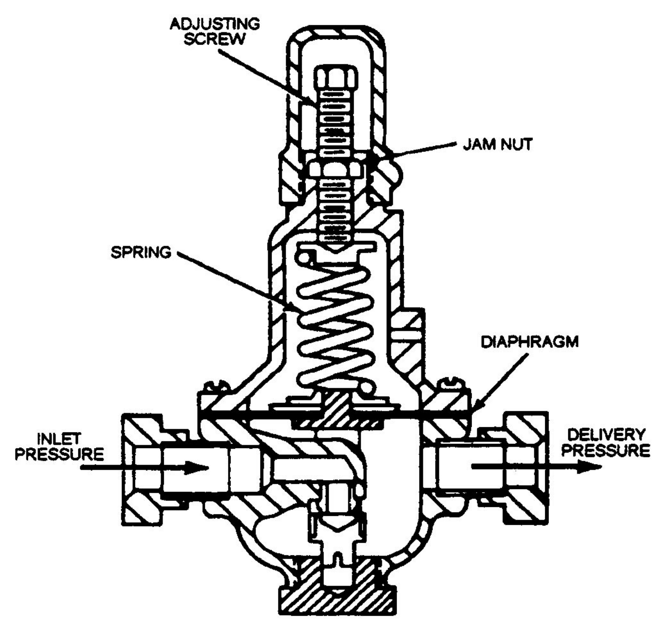


Figure 5-4.—Pressure-reducing control valve.

Hytrol Valve

The hytrol valve (fig. 5-5) either isolates inlet pressure from the pressure-reducing control valve, or vents inlet pressure to the pressure-reducing control valve and the fuel port of the main valve. Pressure directed from the SOPV to the top of the diaphragm holds the hytrol valve closed. When this pressure is vented (also through the SOPV), the inlet pressure opens the hytrol valve allowing fuel flow. No adjustments are made to the hytrol valve. It is either open or closed.

Ejector-Strainer

The ejector-strainer (fig. 5-6) reduces inlet pressure to the pressure-reducing control valve, and filters fuel. It consists of an orifice plug and a 60-mesh monel screen located between the inlet port and three discharge ports. The orifice plug creates reduced pressure by increasing fuel velocity (like an eductor). This aids in vacating the cover chamber of the fuel valve. The monel screen traps foreign particles and contaminating substances. The three discharge ports direct filtered fuel to the pressure-reducing control valve, the flow control valve, and the SOPV.

Solenoid-Operated Pilot Valve (SOPV)

The SOPV (fig. 5-7) shifts the Cla-Val assembly from the defuel to the fuel mode of operation, and vice versa. The SOPV is a direct acting, solenoid-actuated valve. It is a four-way valve with a grooved stem that moves back and forth in a machined bore inside the body. When the solenoid is energized in the fueling mode, the stem is drawn against spring compression by the magnetic pull of the solenoid. When the solenoid is deenergized in the defueling mode, the stem is returned by the extension of the core spring. Movement of the valve piston directs full flow in one direction or full flow in the opposite direction. There is no closed-port position. The valve is also equipped with a manual operator. Manual operation is done by pushing upward on the button at the lower end of the control. A quarter-turn clockwise locks the manual operator in place.

The solenoid is housed in an explosion-proof case and meets the requirements for use in hazardous locations.

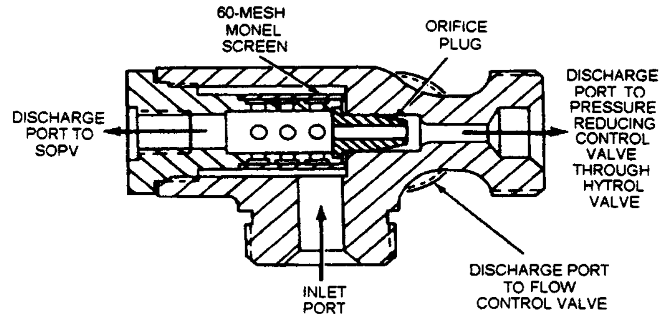


Figure 5-6.—Ejector strainer.

Flow Control Valve (Needle Valve)

The flow control valve (fig. 5-8) consists of a needle valve with a spring and disk assembly within a housing. The housing cover can he removed to allow for needle valve adjustment. The flow control valve is installed in the line between the ejector-strainer and the fuel valve cover chamber.

The flow control valve, by virtue of its construction, controls the flow from the fuel valve cover chamber,

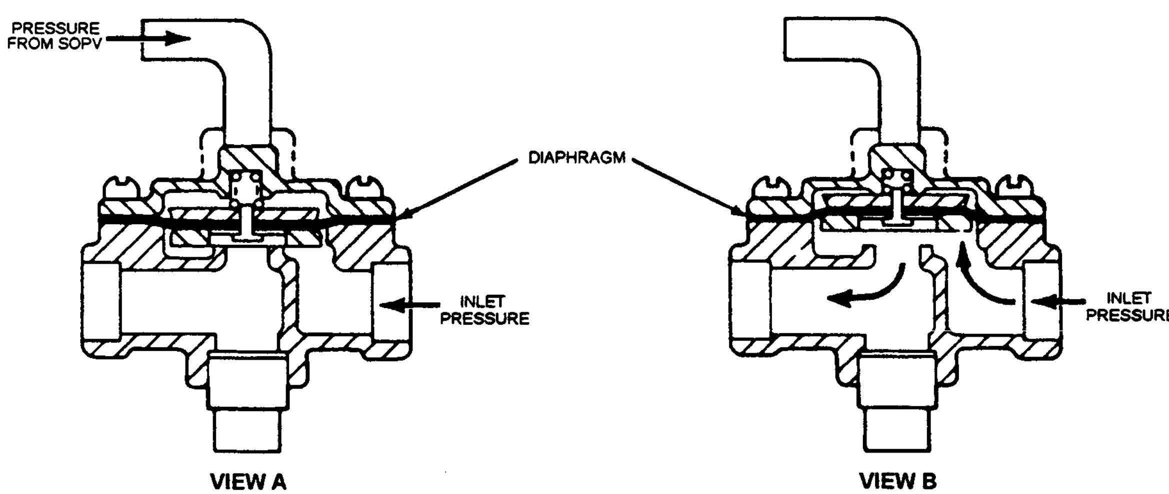


Figure 5-5.—Hytrol valve.

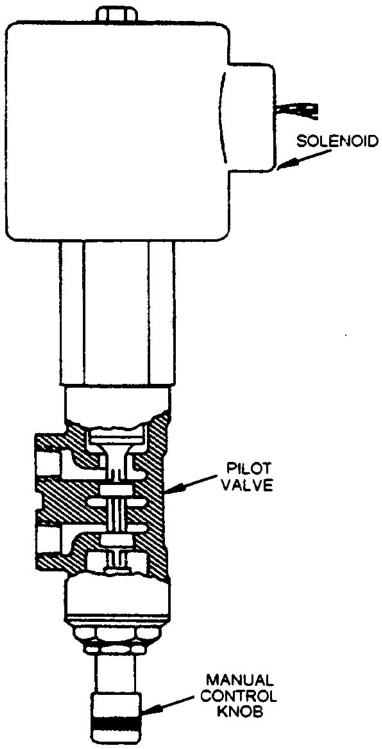


Figure 5-7.-Solenoid-operated pilot valve (SOPV).

which controls the reaction time of the fuel valve. This is done by restricting fuel flow through the needle valve and disk assembly. Flow in the opposite direction lifts the disk up off the seat, permitting free flow.

Operation of the Cla-Val

A step-by-step analysis of the valve's operation is as follows. Figure 5-9 shows the valve in the fueling position.

1. The solenoid is energized.

2. The SOPV directs pressure from the main valve inlet into the cover chamber of the defueling valve, holding it closed.

3. The SOPV also vents the cover chamber of the hytrol valve to the defueling line. This permits the pressure-reducing control valve to take over control of the fueling valve.

4. When the pressure-reducing control valve goes into operation, high pressure fuel enters the fueling valve and bypasses through the ejector-strainer to the pressure-reducing control valve, which is held open by its compression spring. With pressure at the pressure-reducing control valve below the adjusted setting, a maximum flow is permitted through the ejector-strainer. This creates a reduced pressure in the main valve cover chamber, which allows the fueling valve to open to build up pressure in the downstream system. The increasing downstream pressure is transmitted through the pressure reducing control valve line to the under side of the pressure reducing control valve diaphragm.

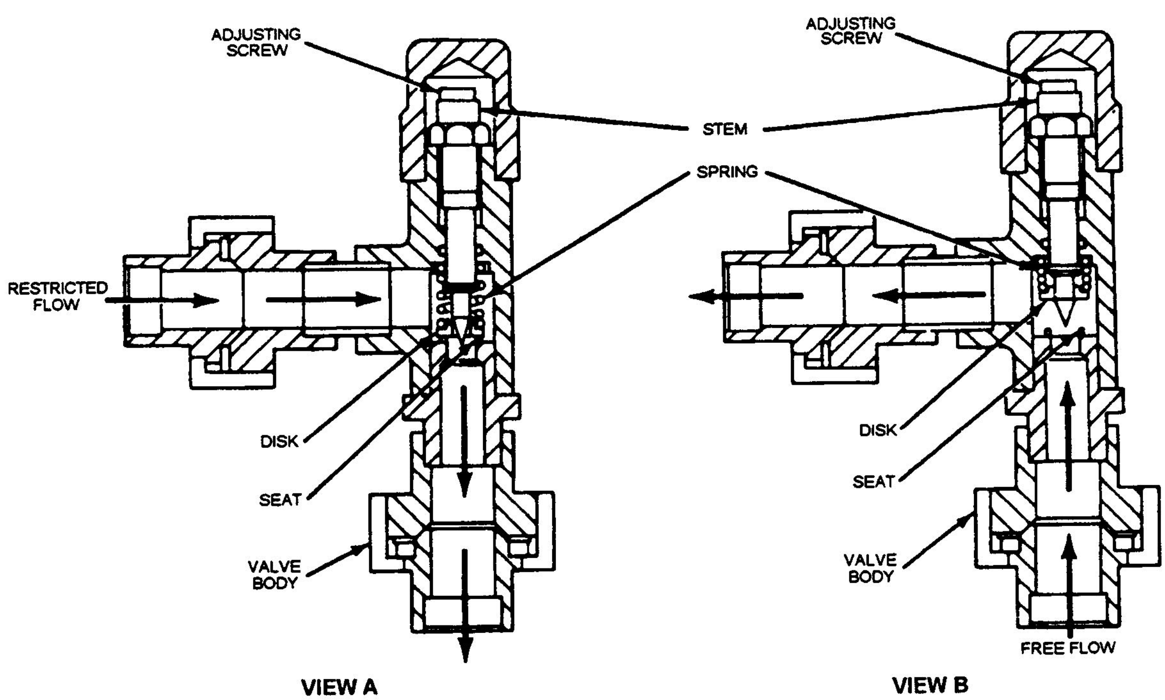


Figure 5-8.—Flow control valve (needle valve).

NOTE

The flow control valve controls the rate in which fuel is evacuated from the cover chamber of the fueling valve and the speed the fueling hose charges. It should be adjusted so the fuel hose charges gradually. If the hose charges too hard, the possibility of equipment damage and injury is increased.

5. When the pressure under the pressure-reducing control valve diaphragm reaches a point where it balances the loading of its compression spring, the pressure-reducing control valve begins to close, thus restricting the flow through the ejector-strainer sufficiently to increase the pressure in the main valve cover chamber. The resulting increase in pressure in the cover chamber forces the disk toward the seat until the main valve is passing just enough fuel to maintain a down-stream pressure that balances the loading of the pressure-reducing control valve compression spring. Any subsequent change in fuel demand tends to cause a slight change in downstream pressure, which results in the pressure-reducing control and main valves assuming new positions to supply the new demand.

6. As long as normal fueling operation is in process and the flow rate is not changing rapidly, the fueling

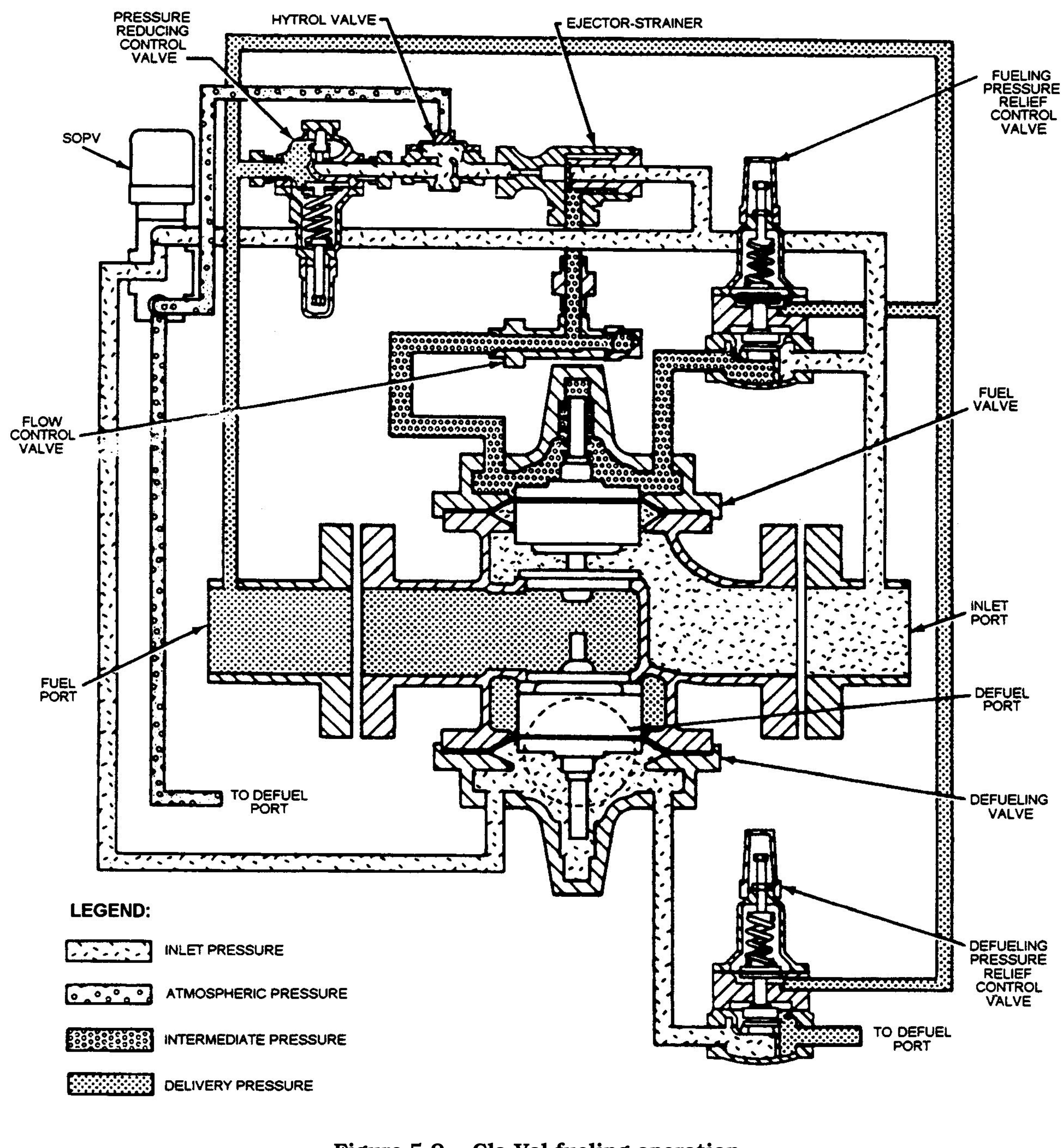


Figure 5-9.—Cla-Val fueling operation.

valve functions as outlined above. If the flow rate suddenly decreases, two things occur:

a. Any pressure rise is offset by the opening of the defueling valve.

b. The fueling valve closes rapidly.

7. Figure 5-9 shows that delivery pressure is reflected under the diaphragm of both pressure-relief control valves, opposing the force applied by the spring. When a downstream pressure rise occurs that is sufficiently high to overcome the force of the spring, the defueling valve pressure-relief control valve opens to relieve pressure from the cover of the defueling valve. This allows the defueling valve to open, thereby relieving excess pressure into the defueling line.

8. When pressure and flow conditions return to normal, all valves resume their normal functions.

Defueling Operation of the Cla-Val

The defueling operation of the Cla-Val follows. Figure 5-10 shows the valve in the defueling position.

1. The solenoid is deenergized.

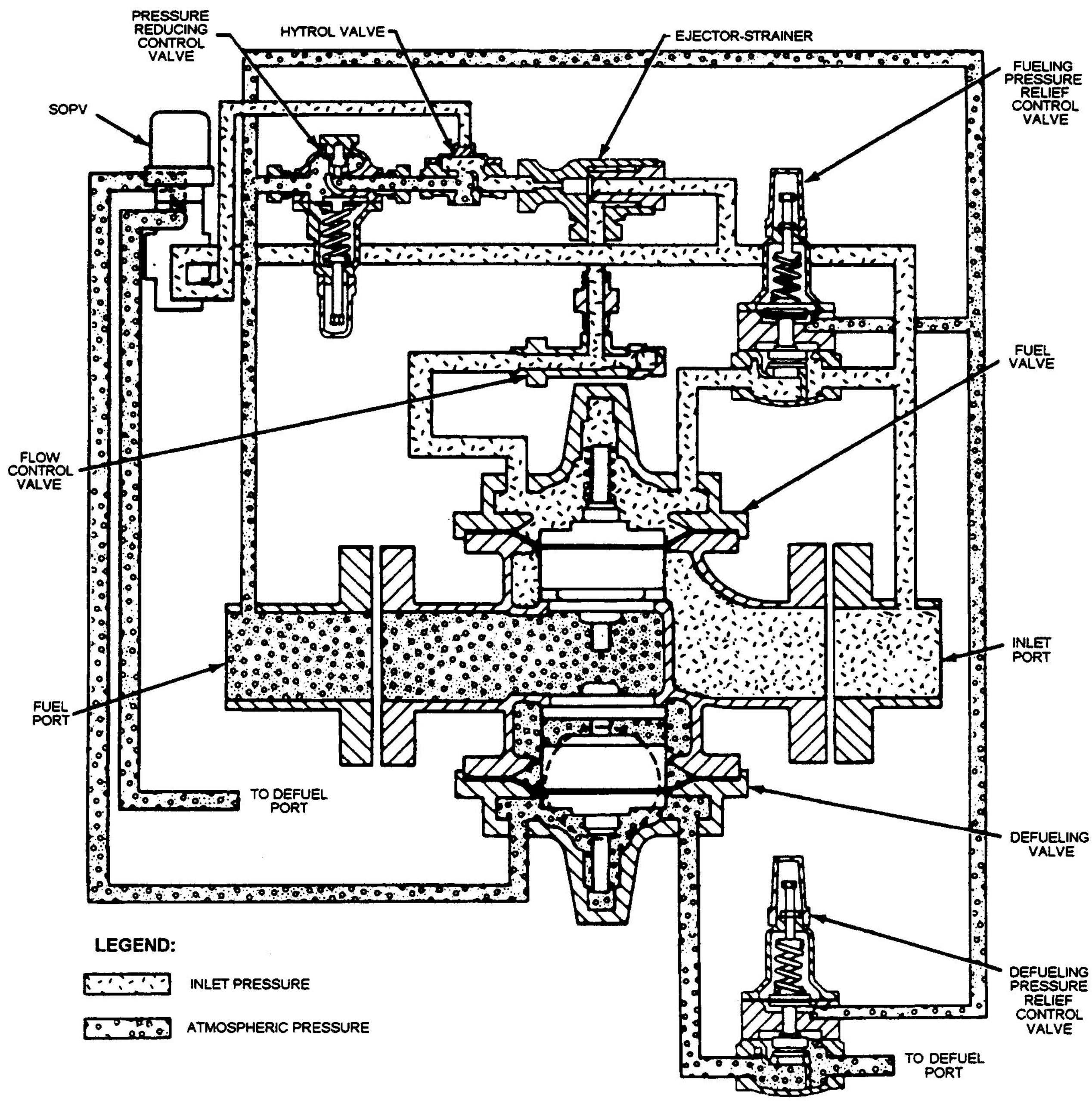


Figure 5-10.—Cla-Val defueling operation.

2. The SOPV directs pressure from the main valve inlet into the cover chamber of the hytrol valve, holding it closed. This diverts high pressure through the ejector-strainer into the cover chamber of the fueling valve, holding it closed.

3. The SOPV also vents the cover chamber of the defueling valve to the defueling line. With pressure released from the cover chamber, the defueling valve opens by virtue of its own weight and inverted design. The defueling valve will have a controlled opening rate produced by a restriction tube elbow located in the line from the cover chamber.

Cla-Val Fuel/Defuel Pressure-Setting Procedures

Procedures are the same for all pressure settings; only the pressure will vary. This example is for a final delivery pressure of 50 psi. The pressure-setting procedures are the following:

1. A pressure gauge must be installed in the line between the fuel/defuel valve and the hose.

2. Remove adjusting screw housings for both pressure-relief control valves and the pressure-reducing control valve.

CAUTION

Do not turn these screws beyond the point at which they become tight. Damage to the internal parts of the valve may result.

3. Loosen all three jam nuts and gently screw the adjusting screw on both pressure-relief control valves all the way in.

4. Line up and pressurize the service system.

5. Unreel the hose and connect the nozzle to the defuel main. (Use proper grounding procedures.)

6. Start the defuel pump.

7. Place the toggle switch to the ON position.

8. Slowly turn the adjusting screw on the pressure-reducing control valve until the gauge in the delivery line reads 10 psi higher than the desired pressure (60 psi in this example).

9. Tighten the jam nut to lock the adjusting screw.

10. Slowly turn the adjusting screw of the defuel valve's pressure-relief control valve until the delivery pressure gauge dips downward approximately 2 1/2 psi (57 1/2 psi in this example).

NOTE

The defuel valve's pressure-relief control valve will be set 7 1/2 psi higher than delivery pressure.

11. Tighten the jam nut to lock the adjusting screw.

12. Loosen the jam nut and slowly turn the adjusting screw of the pressure-reducing control valve until the delivery pressure drops to a point 5 psi above the desired delivery pressure (55 psi).

13. Tighten the jam nut.

14. Slowly turn the adjusting screw of the fuel valve's pressure-relief control valve until the delivery pressure gauge begins to dip downward approximately 2 1/2 psi (52 1/2 psi).

NOTE

The fuel valve's pressure-relief control valve will be set 2 1/2 psi higher than delivery pressure.

15. Tighten the jam nut to lock the adjusting screw.

16. Loosen the jam nut and slowly turn the adjusting screw of the pressure-reducing control valve until the delivery pressure has dropped to the desired delivery pressure (50 psi).

17. Tighten the jam nut to lock the adjusting screw.

18. Replace all adjusting screw housings.

19. Secure station.

Trouble-shooting Procedures

To do troubleshooting, you must completely understand the function of the Cla-Val. Before you actually make any mechanical adjustments, carry out the following steps:

1. Be sure that the SOPV is operating when the fueling switch is turned to the ON position and that it is being deenergized when the switch is turned to the OFF position. (This is commonly called a "click" test.)

2. Be sure the inlet pressure is high enough to maintain the required delivery pressure. Inlet pressure should be at least 10 pounds higher than desired delivery pressure.

3. Check to see if the protective housings are missing or damaged. If they are, this may indicate improper adjustment of the control valves.

4. Be sure that no part of the control valve system has been removed, disturbed, or damaged.

The above checks may indicate the probable source of trouble. If not, the step-by-step procedures outlined in the following paragraphs should be followed. As always, when actually troubleshooting equipment, refer to the applicable technical manual.

FUELING VALVE FAILS TO OPEN.— If the SOPV is not operating properly, proceed as follows:

1. Energize SOPV and apply pressure at the main valve inlet.

2. Loosen the tube fitting at the cover of the hytrol valve.

3. If fuel under pressure is present, the SOPV is probably stuck in the deenergized position.

4. Operate the SOPV manually as outlined in operating instructions.

5. If fuel under pressure at the loosened fitting is shut off when the SOPV is actuated manually, the SOPV must be repaired or replaced.

If the hytrol valve fails to open, proceed as follows:

1. Loosen the tube nut at the cover of the valve. No pressure should be present at this point.

2. Make sure there is no pressure in the downstream fueling line. Break the union between the fueling pressure-relief control valve and the hytrol valve.

3. If no pressure is present at the disconnected union, failure of the diaphragm in the hytrol valve is indicated.

4. Remove the cover screws and the cover of the hytrol valve.

5. Remove the diaphragm assembly and replace the diaphragm if ruptured.

6. Reassemble the hytrol valve. Reconnect the union and tubing fittings.

FUELING VALVE FAILS TO CLOSE.— If the SOPV is not operating properly with the solenoid de-energized and pressure at the main valve inlet, proceed as follows:

1. Loosen the tube nut at the cover of the hytrol valve to determine whether or not fuel is under pressure at the loosened connection.

2. If there is no flow under pressure, SOPV failure is indicated.

3. Operate the SOPV manually as outlined in the operating instructions.

4. If pressure is received at the loosened tube connection when the SOPV is actuated manually, this indicates the SOPV must be replaced or repaired.

The ejector-strainer may be clogged. Carry out the following procedure:

1. With no pressure at the valve inlet, remove the large box nut on the end of ejector-strainer.

2. Inspect the screen and clean it if it appears to be clogged.

3. Inspect the secondary jet to make sure it is not plugged.

FUELING VALVE FAILS TO MAINTAIN DESIGNED DELIVERY PRESSURE.— If the pressure-reducing control valve is not operating properly, carry out the following procedures:

1. Remove the adjusting screw housing.

2. Loosen the jam nut and turn the adjusting screw clockwise.

3. If the fueling valve opens during this procedure and delivers fuel at art increased and constant pressure, it is an indication the pressure adjustment of the pressure-reducing control valve is incorrect.

4. To remedy, follow the entire “Pressure Setting Procedure” outlined in the operating instructions.

Fueling pressure-relief control valve may be held open.

—The correct setting of this valve is 2 1/2 psi higher than the pressure setting of the pressure-reducing control valve.

—If the fueling pressure-relief control valve is adjusted to a pressure equal to or lower than the desired delivery pressure, the fueling pressure-relief control valve will be held open. If it is open, inlet pressure will flow into the cover chamber of the fueling valve and hold it closed.

—If this appears to be the trouble, remove the adjusting screw housing, loosen the jam nut, and turn the adjusting screw clockwise until it bottoms. This should close the pressure-relief control valve. If this was the trouble, the pressure settings should be re-adjusted as outlined in the operating instructions.

The fueling valve diaphragm may be ruptured. This occurrence is very unlikely. However, if all other steps have been followed and indications are that the main valve is faulty, follow these steps:

1. Remove all fittings from the cover of the fueling valve.

2. Remove the nuts holding the cover in place and lift off the cover.

3. Lift the diaphragm assembly out of the valve and examine the diaphragm for any holes.

4. Replace the diaphragm with a new one if necessary.

5. While the diaphragm assembly is out of the valve, the disk should be checked to see that it is in good condition. Replace if necessary.

6. When reassembling the valve, make sure the internal spring fits into its recess in the cover.

7. When the valve is returned to service, follow the procedure outlined in the operating instructions.

HOSE REELS

Each hose reel assembly (fig. 5-11) stores 150 feet of 2 1/2-inch collapsible hose or 1 1/2-inch non-collapsible hose. Each hose reel assembly consists of a drum, swing joint and elbow assembly, a support frame, and a manual brake. The drum holds, reels, and unreels the hose. The swing joint and elbow assembly permits rotation around the central axis of the drum, and also houses a spider assembly for the continuity circuit. The support frame provides permanent mounting for each drum. The manual brake prevents the drum from rotating when not in use.

The swing joint (fig. 5-12) is made of brass, to resist corrosion. The continuity wire enters the top of the flange on the fuel inlet side of the swing joint. It is connected to an amphonel stud that is insulated from the brass to prevent grounding out. Both ends of the stud have very small O-rings that are held in place by flat washers. The washers are, in turn, held in place by nuts that are threaded on to the amphonel stud.

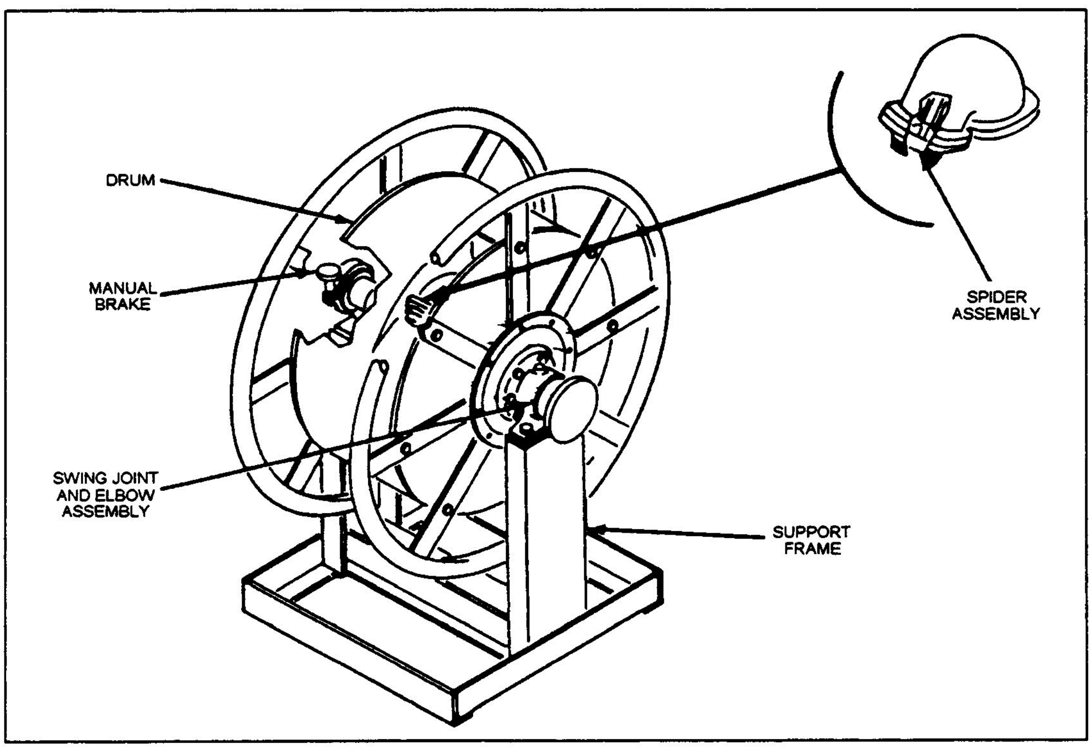


Figure 5-11.—Hose reel assembly.

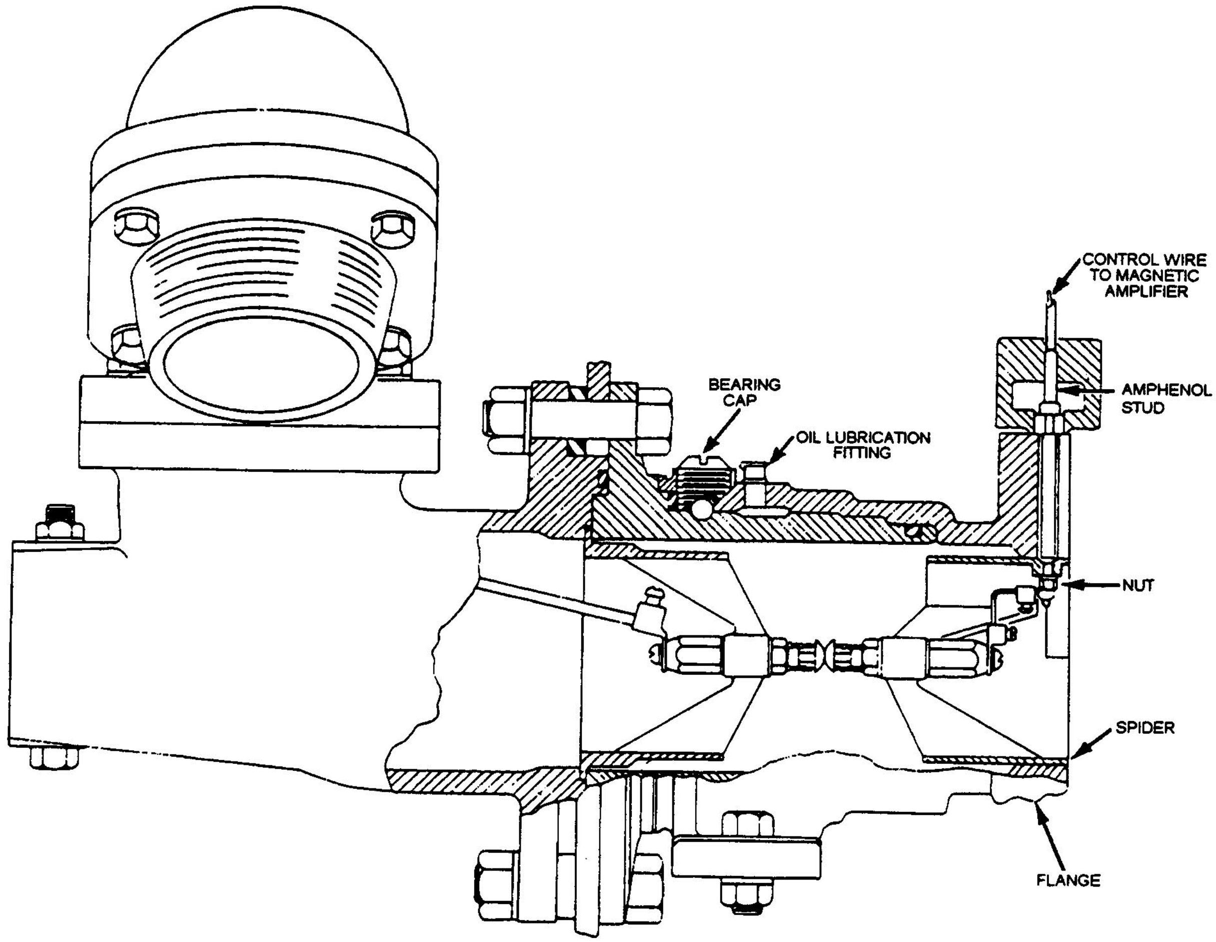


Figure 5-12.—Swing joint.

NOTE

The purpose of the O-ring is to prevent leakage of fuel around the amphonel stud. Sometimes, due to vibration, the nuts become loose, and leakage around the stud will occur. If you use a lock washer and double nut on the stud, you will lessen the chance that the nuts will back off because of vibration.

The amphonel stud is connected inside the swing joint to a spider assembly. The spiders inside the hose reel are connected from the swing joint by direct contact of spider to spider. The other spiders inside the drum area are connected by a hard wire.

The spider assembly in the male end of the hose reel (where the hose attaches) connects directly with the spider assembly in the female end of the fuel hose. Each end of the fuel hose has a spider assembly installed.

FUEL HOSE

Aviation fuel hoses are designed to pressure refuel aircraft quickly and safely. There are three types and sizes the ABF will typically use:

- 2 1/2-inch collapsible, used for refueling aircraft
- 2 1/2-inch non-collapsible, used for defueling aircraft
- 1 1/2-inch non-collapsible, used for defueling aircraft, boat fill, tractor fill, etc.

NOTE

Hoses on fueling stations that are used for defueling may be also used for fueling providing they are properly flushed.

All hoses come in standard 50-foot lengths or 100-foot bulk lengths. The 50-foot lengths come as a complete assembly. The 100-foot lengths are hose only and require installation of the couplings and continuity wire.

One end has a male coupling and the other end has a swivel-type female coupling (fig. 5-13). Leakage between the couplings is prevented by an O-ring in the female coupling. Both couplings are machined to receive the nylon spiders that act as non-conducting supports for connecting the continuity wire. The continuity wire runs through the hose and is slightly longer than the hose, to allow for hose stretching.

New hoses and hoses that were out of service for a long time must be cured (pickled) before being placed in service. Use the following procedure:

NOTE

Some new hoses manufactured according to Mil-H-17902 do not require pickling. How-ever, they must still be flushed and tested prior to use.

1. Flush the hose with 100 gallons of fuel.

2. Cap one end and elevate the hose.

3. Fill the hose, cap it and let it stand for at least 1 week.

4. Drain the hose and observe drainage for discoloration. (If discoloration is observed, repeat steps 1 through 3.

5. Test the fuel with the CFD. (Should be less than 10 mg/1.)

6. Install the hose and flush until acceptable fuel is sampled. (Less than 2 mg/1.)

Because of their environment, fuel hoses are subjected to severe wear and tear. They should be inspected during each use for superficial cuts, worn areas or bubbles in the hose, deep cuts that expose the wire reinforcement or inner layer wrapping, and leaky couplings.

If any of the above is observed, notify the flight deck supervisor, flight deck control, and flight deck repair immediately.

You can prolong the useful life of fuel hoses by not twisting or kinking a hose, not rolling a twisted or kinked hose up on its reel, and not allowing aircraft, tractors. or other rolling stock to run over the hoses. New fuel hoses are hydrostatically tested before being placed in-service, and in-service hoses are hydrostatically tested annually. In accordance with PMS requirements, fuel hoses are tested at 1 1/2 times their system operating pressure.

If a hose is found to be damaged near an end coupling but otherwise usable, it may be salvaged by cutting the damaged area off. This is known as “cutting back” a hose. To cut back a fuel hose, do the following:

1. Disconnect and remove the spiders and continuity wire from the hose.

2. Remove the coupling from the damaged end.

a. Unscrew the external taper sleeve from the coupling end and slide it down past the damaged area.

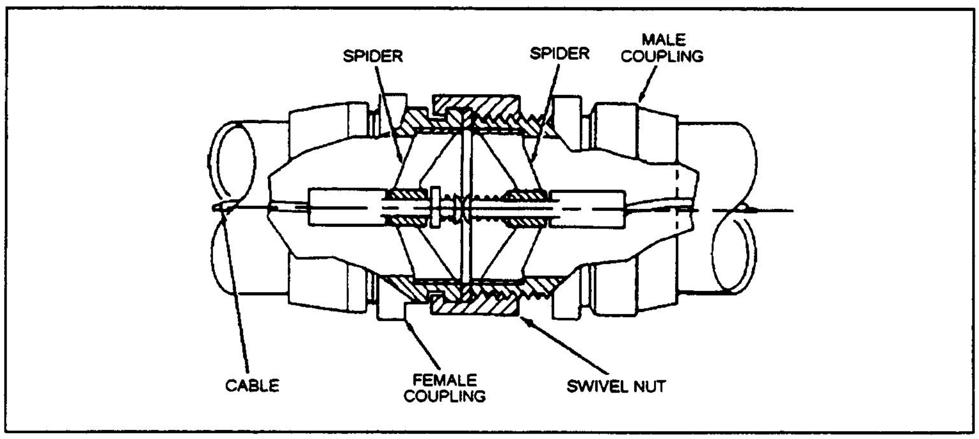


Figure 5-13.—Fuel hose couplings.

b. Work the wire helix (spiral) down and off the coupling end.

c. Remove the coupling end.

d. Remove the wire helix.

3. Make sure the hose is squared up, and mark the hose for cutting, using the taper sleeve as a guide. After marking, remove the taper sleeve.

4. Cut fabric-reinforced hose with a sharp knife wetted with fresh water. Cut wire-reinforced hose with a new or sharp hacksaw with fine teeth. Insert a round wood plug into the hose to eliminate the danger of loosening the inner liner or damaging the wire reinforcement while cutting.
coat of barrier.

5. Paint the freshly cut hose end lip with a light coat of zinc chromate primer to provide a moisture barrier.

6. Slide the external taper sleeve back on the hose.

7. Slide the wire helix on and position it about 6 inches down from the end of the hose.

8. Insert the coupling end into the hose, ensuring the hose is bottomed at the lip of the coupling end.

9. Work the wire helix up and into position over the inserted part of the coupling end. Be careful not to overexpand the wire helix.

10. Slide the taper sleeve into position and screw it tightly to the coupling end.

11. Hydrostatically test the hose as instructed in the appropriate MRC.

12. Cut the continuity wire 10 to 12 inches longer than the hose, to compensate for hose stretch.

13. Reinstall the continuity wire and spiders. Check for electrical contact between the contact buttons at the hose ends, using an ohmmeter. Maximum allow-able reading is 40 ohm.

14. Upon reinstallation on a station, flush the hose until an acceptable sample is obtained.

QUICK-DISCONNECT COUPLING (QDC)

The quick-disconnect coupling (fig. 5-14) is designed to provide the means of attaching the fuel nozzle to the hose. It also contains the switch to energize or de-energize the SOPV. When operating the quick-disconnect coupling, don't jam the switch, and don't drop the coupling on the deck.

The quick-disconnect coupling has a female thread on one side to fit the male threads of the hose. The other end has a female ball bearing quick-release that receives the male end of the nozzle adapter.

NOZZLE ADAPTER

The flange side of the nozzle adapter is bolted to the nozzle. The male end opening provides a means of installing a 100-mesh strainer inside the nozzle assembly. The strainer is held in place by a snap ring that fits into a recessed groove inside the male end.

PRESSURE FUELING NOZZLE

The pressure fueling nozzle connects to all NATO military aircraft and is designed to provide a leak-proof seal between the nozzle and the aircraft for high-capacity fueling operations. This includes sup-plying fuel under pressure to aircraft, and removing fuel by suction from aircraft.

The pressure fueling nozzle is attached to the hose by the nozzle adapter and quick-disconnect coupling. The nozzle outlet attaches solidly to the aircraft refueling adapter. The nozzle is secured to the aircraft by aligning the slots in the nozzle with the lugs on the aircraft adapter, pressing the nozzle firmly against the aircraft adapter, and rotating the collar clockwise until the internal stops are contacted.

The JC Carter D-1 and MD-1 are the pressure fueling nozzles most widely used in the Navy.

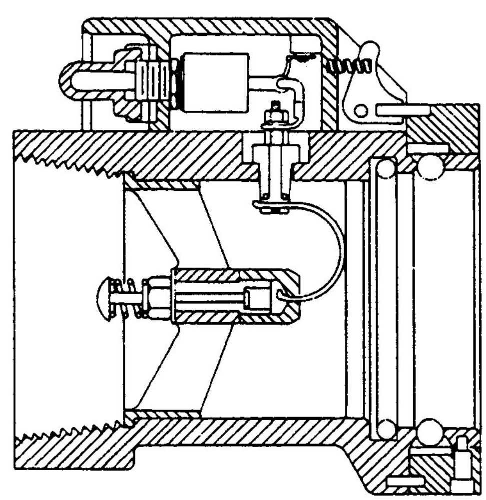


Figure 5-14.—Quick disconnect coupling with toggle switch.

The MD-1 (fig. 5-15) is the newer nozzle and will eventually replace all D-1 nozzles. Although physically similar, they differ internally, as the collar on the MD-1 nozzle swivels independently of the body. On the D-1 nozzle, the body and collar are one unit. Because the MD-1 is scheduled to become the standard pressure nozzle used in the fleet, it is the only one discussed here.

The MD-1 pressure fueling nozzle consists of four major components. They are the collar assembly, the nose seal assembly, the body, and the valve operating linkage.

Collar Assembly

The collar assembly holds the dust cover and the bumper. The dust cover is used to keep dust, dirt, and moisture out of the nozzle. The bumper is to provide additional protection to prevent accidental damage to the nozzle. The collar is attached to the body by 49 ball bearings.

Nose Seal Assembly

The nose seal assembly acts like a modified O-ring to seal the nozzle to the aircraft refueling connection and prevent leakage at the connection. It is made of metal and an O-ring type material. It also provides a housing for the poppet.

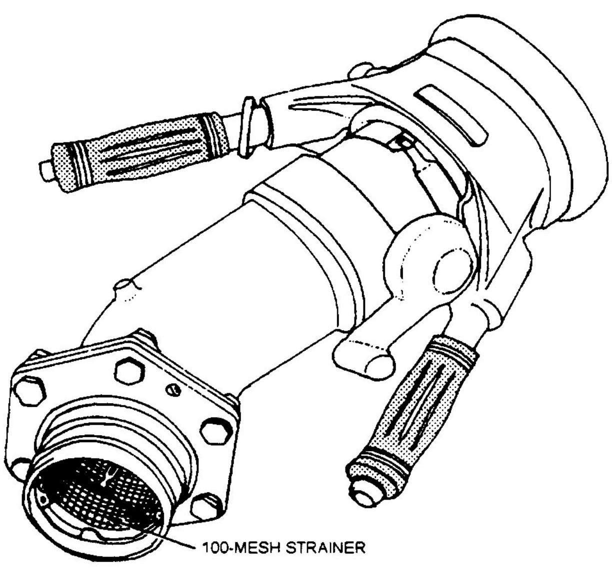


Figure 5-15.—MD-1 Pressure fueling nozzle with nozzle adapter and strainer.

Body

The body houses the actuating linkage, indexing pins, collar lock pin, and the collar lock pin spring. It also has an opening to connect the sample connection and another opening to connect the actuating lever. The bottom of the body is attached to the inlet elbow by 39 bearings. Leakage between the body and other attached parts of the nozzle is prevented by O-rings.

Valve Operating Linkage

The valve operating linkage connects the actuating lever to the poppet. When the actuating lever is rotated up and forward, the linkage pushes out the poppet and opens the nozzle. When the actuating lever is rotated backward and down, the linkage pulls the poppet back into the nose seal assembly and closes the nozzle.

The poppet is made of Teflon®-coated cast aluminum. A shroud on the bottom of the poppet eliminates turbulence while fueling. The nozzle poppet pushes on the aircraft fueling adapter poppet when opening, thereby opening the aircraft fueling adapter.

GRAVITY (OVERWING) FUELING NOZZLE

The gravity fueling nozzle (fig. 5-16) is manually controlled. Like the pressure refueling nozzle, it is attached to the end of a fuel hose by a nozzle adapter and quick-disconnect coupling. The nozzle outlet is inserted directly into the fuel tank. The nozzle is actually a valve for controlling the rate of fuel flow, and it closes automatically when hand pressure is released.

When you move the control lever toward the nozzle handle, fuel is allowed to flow through the nozzle. A dual valve in the nozzle allows a gradual opening or closing of the nozzle.

The control lever presses against the valve stem and lifts a small valve disk that is held against its seat by a compression spring. When you open the smaller valve, you avoid a sudden flow of fuel (known as cracking the valve). After cracking, the continued action of squeezing the handle depresses the valve stem farther, and a shoulder on the stem meets the large disk assembly, opening the valve fully. In closing the nozzle, the operation is reversed, and the larger valve disk closes first. The small stream still coming through the valve relieves the stress on the hose, which results if the complete flow is suddenly stopped. Fully releasing the control lever closes the

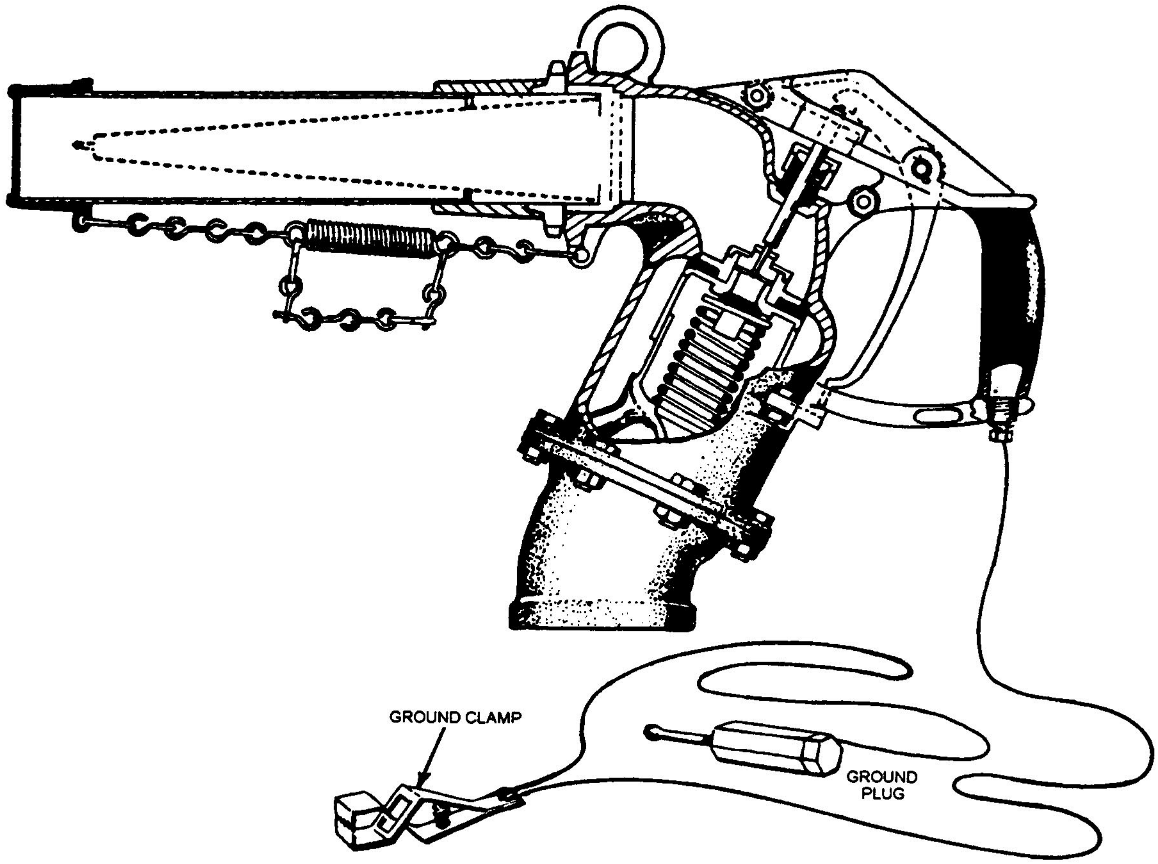


Figure 5-16.—Gravity fueling nozzle.

smaller valve, and the nozzle is then completely closed.

Never block the gravity fueling nozzle in an open position. Ratcheted handles that allow the operator to lock the handle in the open position are prohibited. The nozzle must always be controlled by hand, so that the flow of fuel may be instantly stopped when necessary. A strainer or screen installed in the nozzle provides a last means of stopping any dirt or foreign matter from entering the aircraft fuel tanks. This strainer should never be left out of the nozzle if it is to be used for fueling aircraft.

DEFUEL PUMP

The defuel pump used in Cla-Val fueling stations is the Blackmer rotary vane, positive displacement pump. It is described in detail in chapter 4 of this manual.

Flight and hangar deck station defuel pumps are normally set to pump 100 gpm at 15 psi.

PORTABLE DEFUEL PUMPS

The portable defueling pumps are either an air-motor-driven internal gear pump or an air twin-diaphragm pump mounted on a mobile cart. Both pumps are operated off the ship's low-pressure air system.

Three hoses are used with the defueling unit: an air hose, which has a 1/2- or 3/4-inch inside diameter, and two defueling hoses, which have 1 1/2 or 2 1/2-inch inside diameter. One defueling hose is used as a suction hose. It should be as long as necessary to reach from the aircraft to the defueling unit. The longer the hose, the less effective the defueling unit is. The other defueling hose is used for the defueling unit discharge hose. The length of this hose has little effect on the defueling unit operation as long as it does not become kinked.

The defueling suction hose is connected to the aircraft in several different ways. For jet aircraft having single-point fueling/defueling capability, the hose is connected to the aircraft through a pressure fueling nozzle. For aircraft drop tanks, the hose without a fitting is inserted into the tank fill opening or pushed up over a drain fitting on the bottom of the tank. When defueling drop tanks only, the method normally used is to insert the defueling suction hose into the tank through the tank fill opening. For total defueling, defuel through the aircraft pressure fueling adapter. The discharge hose from the defueling unit is connected to the fill connection through a special fitting.

CONTINUITY

Electrical continuity is a firm requirement for all aircraft refueling stations. Electrical continuity must be present and maintained to ensure personnel safety, equipment protection, and efficient fueling operations.

With electrical continuity present, the nozzleman fueling the aircraft has immediate control of fuel flow. This is essential to prevent fuel spills and possible accidents during aircraft refueling. Electrical continuity is present when wires are provided and switches are set to allow an electrical current to flow away from the controller and back to it through a solid metallic path.

Now, let's follow the continuity circuit (fig. 5-17). Starting the defuel pump applies power to the solid state relay, but nothing happens, because the circuit is broken. Make sure your ground wire to the deck is grounded to metal. Then hook it to the aircraft. Remove the dust cover and connect the nozzle. Flip the switch in the quick-disconnect housing to ON, which closes the circuit. The ground then goes back through the spiders in the quick-disconnect coupling to the wire in the hose. From there, it goes back to the

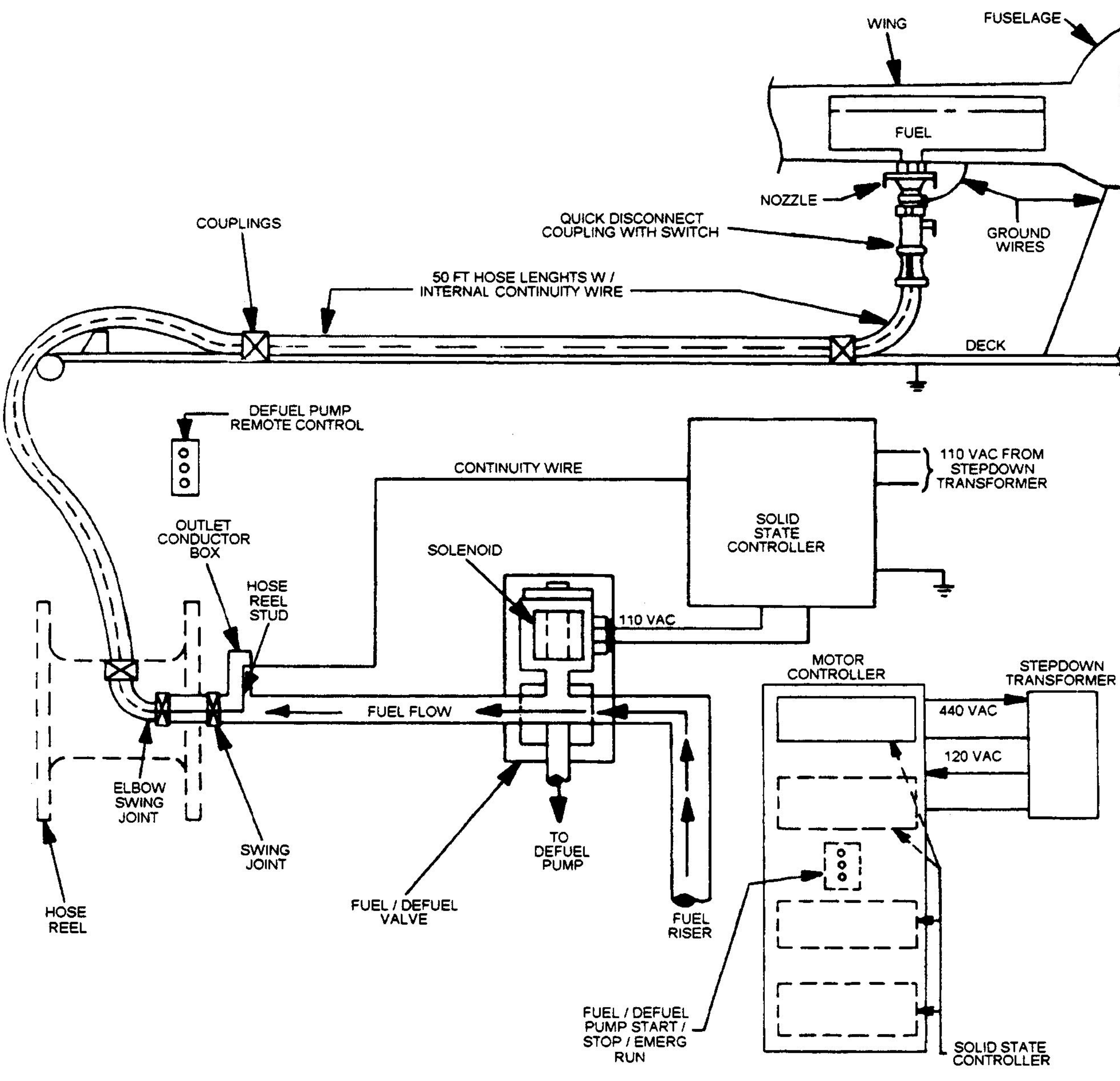


Figure 5-17.—Electrical continuity control for the Cla-Val fueling station.

hose reel hub, to the swing joint, through the amphonel stud to the junction box, to the solid state relay (which is also grounded to the ship), and from the solid state relay back to the electric solenoid, which goes to the fuel position.

If the continuity circuit is broken at any place, the solenoid will immediately de-energize, and the Cla-Val will go into the defuel mode.

NOTE

More often than not, if a hose does not charge when the fueling switch is flipped on, the cause is a bad ground. Double-check all grounding connections to ensure metal-to-metal contact is made.

CAUTION

If a hose should rupture while fueling, and the continuity circuit is not broken, FUEL WILL CONTINUE TO BE PUMPED THROUGH THE HOSE AND OUT THE RUPTURE. Immediate action by the nozzleman to flip the QD housing switch to OFF is required to de-energize the SOPV so the Cla-Val will go into the defuel mode. If the nozzleman is unable to do this, the station operator should turn the defuel pump off (this will also break the continuity circuit) and close the station riser valve.

SHIPBOARD AIRCRAFT REFUELING PROCEDURES

LEARNING OBJECTIVES: Identify various flight and hangar deck fueling and defueling operations. Explain proper procedures for each operation.

The actual fueling or defueling operation is the end result of several actions. Unlike below-decks operations, flight-deck operations are rarely routine.

Fueling assignments on the flight and hangar deck are made by the Aviation Fuels Flight Deck Control Talker. The Control Talker works closely with the Handler and CAG Maintenance Chief to ensure aircraft and support equipment are fueled quickly and safely.

The following shipboard operating procedures cover only those activities directly involved with the refueling of aircraft. They do not cover the below-deck operations that must be performed in conjunction with the aircraft refueling operation. The procedures presented here are the typical ones used aboard ship.

Specific shipboard operating procedures, including below-deck activities as well as aircraft refueling, are contained in the *Aviation Fuels Operational Sequencing System* (AFOSS). As in all fueling evolutions, use the specific procedures published in your ship's AFOSS.

Skill, experience, and good judgment are the keys to running a successful flight deck.

HAND REFUELING SIGNALS

In the upcoming pages, we will discuss operations. All successful operations depend on how well you can communicate with the person with whom you want to communicate. Since the flight deck is often very noisy, you cannot talk directly with the pilot or even members of your fueling crew; you must use hand signals. A clear understanding of hand signals is required. See figure 5-18 for an easy-to-follow diagram of refueling signals. It is very important that you, the ABF, know the correct hand signals for refueling.

Study the figure carefully. As an ABF, you will constantly use hand signals. When an aircraft lands on deck, one of the first questions asked is, "What is your fuel load?" The question and answer are communicated with hand signals.

AIRCRAFT PRESSURE REFUELING WITH ENGINES OFF (COLD REFUELING).

A minimum of three people are needed for refueling an aircraft: refueling crewman, refueling station operator, and a plane captain. A crewleader (safety person) is also recommended, but it is possible for the safety person to supervise more than one fueling operation.

Aircraft refueling tasks are to be performed in the following sequence:

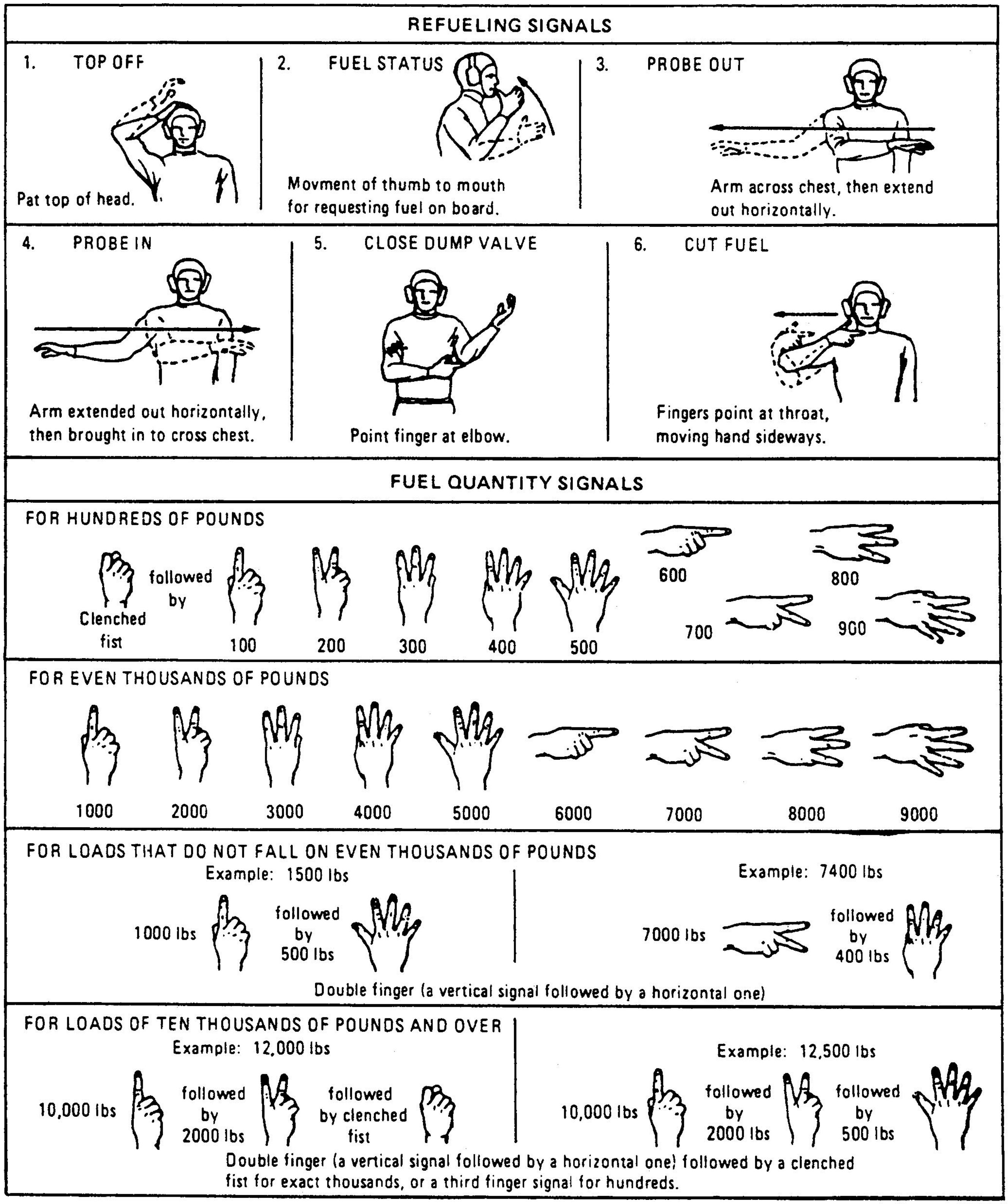


Figure 5-18.—Refueling hand Signals.

1. Secure all electronic and electrical switches on the aircraft not required for fueling. Once a fueling evolution has commenced, the aircraft's electrical power status and connections are NOT to be changed until the evolution is completed. This means the following:

a. NO aircraft engines or auxiliary power units will be started or stopped.

b. External power will NOT be connected, disconnected, or switched on or off.

c. Changing the aircraft's electrical power status can create significant ignition sources.

2. Verify that manned fire-fighting equipment is in the area. The flight deck P-16 is manned by crash and salvage personnel when aircraft are aboard, and satisfies this requirement for fueling on the flight deck. On the hangar deck, if no roving fire-fighting equipment is manned, the fuel crew must have a portable fire extinguisher manned nearby.

3. Take a sample if needed for quality surveillance checks. The hose (not the entire station) is considered ready for use if an acceptable fuel sample was taken under normal flow conditions within the preceding 24 hours. If this has not occurred, the hose MUST be flushed through the flushing connection into the selected contamination tank, and a sample taken and tested for contamination prior to refueling the first aircraft. Fueling must NOT begin until acceptable sample results are obtained. The Maximum allowable limits for sediment and water contamination are 2 milligrams per liter (2mg/1) for sediment, and 5 parts per million (5ppm) for free water.

4. Check for "hot brake" condition (plane captain).

5. Ensure that the aircraft has initial tiedowns. Aircraft tiedowns will not be removed or altered during the aircraft refueling evolution.

6 . Attach the grounding wire from the deck to the aircraft. Grounding connections must be made to bare metal.

7 . Position the fuel hose.

8 . Remove refueling adapter cap from the aircraft and the dust cover from the pressure nozzle. Inspect the face of "the nozzle and make sure it is clean. Inspect index pin area for excessive wear. Verify that the flow control handle is in the fully closed and locked position.

9. Visually inspect the aircraft's adapter (receptacle) for any damage or significant wear. If there is any doubt about the integrity of the adapter, notify the squadron representative.

NOTE

Refueling will not be performed unless qualified squadron personnel are present.

CAUTION

A worn or broken adapter can defeat the safety interlocks of the refueling nozzle, permitting the poppet valve to open and fuel to spray or spill.

10. Confirm that the switch on the nozzle quick-disconnect coupling (QDC) is in the OFF position.

11. Lift the nozzle by lifting the handles; align the lugs on the nozzle with the slots on the aircraft adapter; and connect the nozzle to the aircraft by pressing it firmly onto the adapter and rotating it clockwise to a positive stop. The nozzle must seat firmly on the adapter and not be cocked.

12. Upon receiving signals from the nozzle operator that hook-up is complete and from the plane captain that he is ready to begin the fueling operation, the station operator opens the defueling pump discharge valve, the Cla-Val cutout valve, and the hose reel cutout valve. After checking the gauge for the station supply riser to ensure fuel pressure is available, the station operator starts the defuel pump. The station operator must remain in position at the station controls throughout the fueling operation.

13. Place the quick-disconnect switch in the ON (fuel) position. This energizes the solenoid-operated pilot valve (SOPV) for the Cla-Val and places it in the fueling position.

CAUTION

The flow control handle of the pressure nozzle must be placed in either of two locked positions: fully open or fully closed. The handle is NOT to be used as a flag to indicate fuel flow. Excessive wear on the aircraft adapter and the fuel nozzle poppet will result if the handle is allowed to "float" in the unlocked position.

14. When the hose is fully charged, rotate the nozzle flow control handle to the FULL OPEN position. The handle must rotate 180 degrees to insure that the poppet valve is fully open and locked.

15. Once fuel flow has been established, squadron personnel will exercise the aircraft's pre-check system.

NOTE

The pre-check system simulates the completion of refueling by closing all the tank shutoff valves within the aircraft. All fuel flow into the aircraft should stop within a few seconds to 1 minute of actuating the pre-check system. The primary means of detecting successful pre-check is by observing the flow indicator on the aircraft. If the aircraft is not configured with the indicator, an alternate method is to observe the jerk and stiffening of the refueling hose and/or the pressure spike that occurs at the refueling station. If an aircraft fails pre-check, it can be cold refueled only if procedures are called out in that specific aircraft's NATOPS.

16. Fuel the aircraft as directed by the flight plan. The plane captain will monitor aircraft vents, tank pressure gauge(s) and/or warning lights as necessary. The plane caption is also responsible for ensuring that the aircraft is fueled to the correct fuel load.

17. When directed by the plane captain, rotate the nozzle flow control handle to the OFF and fully locked position.

18. Place the quick-disconnect switch in the OFF position. This deenergizes the solenoid-operated pilot valve (SOPV) and places the Cla-Val in the defueling position.

19. When the hose is evacuated, disconnect the nozzle from the aircraft adapter, replace the adapter cap, and remove the ground wire from the aircraft, then the deck.

20. Move to next aircraft to be fueled. After all aircraft have been fueled, secure the refueling station.

21. Restow the hose.

Aircraft Pressure Refueling With Engines Operating (Hot Refueling)

Hot refueling procedures are the same as the Cold Refueling procedures listed above except for the following additions and precautions:

1. The aircraft pilot will select fuel loading, ensure that the cockpit switches are in the proper positions, and maintain UHF radio contact with Primary (Air Boss).

2. The pilot will secure all electronic and electrical equipment not required for refueling.

3. The pilot will place all armament switches in the SAFE position.

4. The aircraft must NOT be hot refueled if it fails pre-check. Failure of the pre-check indicates a malfunction in the aircraft's fuel system, which can result in a fuel spill and fire.

5. The aircraft canopy and helicopter side doors will remain closed during the entire fueling evolution.

6. Be extra cautious around intakes and exhausts. Assume both engines on a dual-engine aircraft are operating. Although some aircraft can and do shut down the engine on the side where the refueling adapter is located (F-14), most aircraft currently do not (F-18, A-6).

7. Pilot-in-command changes are not permitted during refueling operations.

8. No static samples are to be taken during hot refueling.

NOTE

Hot refueling is performed with the pressure nozzle only.

Overwing Refueling

Overwing (gravity) refueling can be performed only with the engines off. Overwing refueling procedures are the same as cold refueling procedures, except for the following additions:

CAUTION

Fueling with an overwing nozzle requires skill and patience because of the increased chance for a spill. ALWAYS use extreme caution when fueling this way and NEVER block the overwing nozzle in the open position.

1. Overwing nozzles must be grounded to the aircraft (or support equipment) prior to inserting the nozzle.

2. After inserting the nozzle in the fueling receptacle, make sure metal-to-metal contact between the nozzle and the fueling port is maintained throughout the fueling operation.

REFUELING AIRCRAFT WITH AUXILIARY POWER UNIT (APU) RUNNING

The aircraft APU maybe used to supply electrical power for pressure refueling on military aircraft so equipped. Refueling with the APU running is not conducted in the hangar deck. Although this operation is not considered "hot refueling," the following precautions must be observed, in addition to the normal refueling procedures:

1. One person will be at the APU controls in the cockpit.

2. Hand signals/signal wands must be established between cockpit and personnel performing refueling to ensure immediate shutdown in an emergency.

DEFUELING AIRCRAFT

Defueling is one of the most technically demanding and potentially dangerous operations performed by fuels personnel. Most aircraft defueling equipment can defuel an aircraft faster than the aircraft cart release it. The pump's discharge is throttled down to balance its inlet (fuel from the aircraft) to prevent pump cavitation and/or the loss of suction, which would necessitate reflooding of the pump. Once the proper balance is achieved, it is maintained by manipulation of the valve on the downstream side of the pump throughout the defueling operation.

Defuelings normally have lower priority than refueling. Unless otherwise directed and if they are not of an emergency nature, defuelings will be by written request approved by the Aircraft Handling Officer (ACHO). A defuel request for an aircraft leaking fuel is considered an emergency and handled promptly.

The following rules apply to every defueling operation:

- Aircraft defueling must be requested by an authorized representative of the squadron by completing and submitting an Aircraft Defueling Certificate to the ACHO.

- During defueling operations, no other maintenance not directly required to aid the defueling operation is to be performed.

CAUTION

Fuel with a flash point below 140°F SHALL NOT be defueled into the ship's JP-5 system. These systems are not designed to handle fuel with a lower flash point. The risk of explosion and/or fire will significantly increase if fuel with a low flash point is placed in these systems.

- All fuel removed from turbine engine aircraft is assumed to be low-flash-point fuel. Defueled jet fuel will NOT be returned to the ship's JP-5 system without first confirming the flash point of the fuel to be 140°F or higher.

- Prior to any defuel, fuel will be tested for particulates, free water, and flash point. Ultimate disposition will depend on the results of subsequent laboratory tests.

Additionally, JP-5 containing leak-detection dye cannot be returned to a ship's system.

- If during the defuel operation the pump starts to lose prime or cavitate, the operation will be discontinued until the problem is resolved.

- A special log of each defueling operation will be maintained. The following minimum information is contained in the log:

  - All abnormal happenings.
  - Aircraft Buno number.
  - Station/portable defuel.
  - Visual/flashpoint.
  - Scheduled amount to be removed and amount that was actually removed.
  - Disposition of product.
  - Time/date when the defuel operation was started and completed.
  - Name of defuel operator and squadron personnel present during the defuel operation.

- Defueling crews must wear proper safety clothing and goggles.

- Plane captains will be at their aircraft, and aircraft engines stopped. All electronic and electrical switches not required for defueling must be secured.

Ž A fire-fighting unit must& stationed upwind of the aircraft to be defueled.

Defueling With Pressure Nozzle

Perform the defuel operation as follows:

1. Verify that the aircraft has been grounded. If it hasn't, connect the ground wire to the deck and then to the aircraft. Ground connections must be made to bare metal.

2. Unreel the hard hose and lead to the aircraft to be defueled.

3. Ensure the quick disconnect continuity switch is in the OFF (defuel) position.

4. Remove the pressure nozzle receptacle cap from the aircraft.

5. Remove the dust cover from the pressure nozzle.

6. Lift the nozzle by the lifting handles; align the lugs on the nozzle with the slots on the aircraft adapter; and hook up the nozzle to the aircraft by pressing it firmly onto the adapter and rotating it clockwise to a positive stop. The nozzle must seat firmly on the adapter and not be cocked.

7. Open the station defuel valve.

8. Start the defuel pump.

9. Defuel the aircraft as directed.

10. Rotate the nozzle flow control handle to the full open position. (The handle must rotate 180 degrees to ensure the poppet valve is fully open and locked by toggle action.)

11. When defueling is complete, shut the nozzle valve by rotating the nozzle flow control handle 180 degrees to shut and locked position.

12. Stop the defuel pump and shut the defuel valve.

13. Disconnect the nozzle from the aircraft.

14. Replace the nozzle receptacle (adapter) cap on aircraft.

15. Replace the dust cover on the pressure nozzle.

16. Remove the ground wire from the aircraft, then the metal deck.

17. Restow the hose.

Defueling With Overwing Nozzle

If an overwing nozzle is to be used to defuel a drop tank or other similar vessel, the nozzle must first be outfitted with a short length of hose. The bottom of this hose must have notches so suction is not impeded.

Defueling procedures using the overwing nozzle are the same as the defueling procedures for the pressure nozzle, with the following additions:

1. The overwing nozzles must be grounded to the aircraft (or droptank or other vessel) before the nozzle is inserted.

2. The nozzle must remain in metal-to-metal contact with the object being defueled.

3. The nozzle must be physically held open during the defueling evolution. Do NOT block the overwing nozzle in the open position.

HANDLING OF AIRCRAFT CONTAINING FUEL OTHER THAN JP-5

Aircraft that have been either land-based or aerial refueled by USAF, USA, commercial airport, or other equipment/facilities must be assumed to contain fuel other than JP-5 in their tanks. The following precautions apply:

1. Aircraft recovering aboard the ship with mixed fuels shall notify the first available ship's controlling authority (strike, marshal, Pri-Fly) prior to recovery.

2. On deck, the aircraft will be marked with a large *X* across the port and starboard side of the nose. The *X* will be of ordnance-type tape and will remain on the aircraft until it has been certified that the flash point is 140°F or above. Aircraft will be refueled with JP-5 as soon as possible.

3. Every effort should be made not to park aircraft with low-flash-point fuels on hot catapult tracks. Catapult slot seals will be installed before any refueling evolutions commence.

4. Prior to any defuel operation, the aviation fuels officer will ensure the fuel being removed is of satisfactory flash point for shipboard storage.

CAUTION

Fuel with a flash point below 140°F must NOT be defueled into the ship's system. Shipboard aviation fuel systems are not designed to handle fuel with a lower flash point. The risk of explosion and/or fire will significantly increase if fuel with a low flash point is placed in these systems.

If an aircraft containing fuel with a low flash point must be lowered to the hangar deck, fuel samples must be taken from all low point drains of the aircraft and their flash point measured. If the flash point tests results are all above 120°F, the aircraft can be lowered to the hangar deck with the following minimum special precautions:

1. All hangar bay sprinkler groups located in the hangar bay in which the aircraft are parked will be operable.

2. A manned MFFU/TAU will be positioned at a location that will provide coverage of the affected aircraft.

3. The CONFLAG station located in the hangar bay with the affected aircraft will be manned.

4. Hot work will not be conducted in the hangar bay or close to the hangar bay containing the affected aircraft.

SAFETY PRECAUTIONS

Before fueling or defueling is started, the OOD should be notified, permission received to commence, and the smoking lamp put out. At the end of the operation, the OOD should be notified and the smoking lamp lighted. During planned flight quarters, fueling and defueling are expected, and requesting permission from the OOD to fuel and defuel is not necessary, but the OOD should be notified about the recommended condition of the smoking lamp.

Care should be exercised to prevent sparks from striking in locations where fuel is being handled. The supervision of fueling and defueling operations should always be done by a qualified petty officer to ensure that all safety precautions are earned out and that the operation is done properly.

All personnel involved in handling aviation fuels must be fully aware of the constant danger of fire and thoroughly trained in firefighting. They also must know and follow all precautions and proper procedures.

The petty officer in charge of the fueling crew checks with the plane captain or other authorized representative of the aircraft crew to ensure that, unless it is required in the fueling (or defueling) operation or in the quantity gauging system check, no electrical equipment in the aircraft is energized or being worked on. In addition, NO electrical apparatus supplied by outside power (electrical cords, droplights, floodlights) is permitted in or near the aircraft. For night refueling or defueling, only approved flashlights are used.

The fueling or defueling of aircraft is handled by the aviation fuels crew under the direction of the officer who is responsible for this procedure. Fueling or defueling of aircraft is done only by members of an aviation fuels crew.

All personnel directly involved in fueling or defueling evolutions must wear the proper safety gear, even when the ship is not at flight quarters. Cranial, goggles, gloves, jersey, and life vest must be worn during fueling/defueling operations.

No aircraft will be fueled while on jacks.

Simultaneous fueling, loading/downloading of weapons is authorized only as specified in CV and Aircraft Refueling NATOPS Manuals.

JP-5 becomes highly flammable if spraying (such as a ruptured hose or gasket) or wicking (such as a fuel-soaked rag or clothing). Extreme caution should be observed if these conditions occur.

Leaks in aircraft, hose, and connections, or trouble with fueling equipment should be reported immediately to the aviation fuels flight deck supervisor.

CHECKING AND RECORDING FUEL LOADS

On flight decks, the fuels checker will go to all incoming aircraft and check fuel loads and record on checker cards the amount of fuel in the aircraft before fueling and after fueling. The figures that are received and logged on the checker cards are in pounds, not gallons. Pilots and aircrew talk about pounds of fuel because they are concerned with the weight of the fuel.

We, the ABFs, will take the figure in pounds and convert it to gallons by dividing the difference from the start weight to the finish weight by 6.8 (which is how much a gallon of JP-5 weighs). For example, a starting figure from the aircraft is 2,800 pounds and the finish fuel weight is 9,700 pounds; the difference is 6,900 pounds. When you divide 6,900 pounds by 6.8 you will get gallons of fuel. At the end of a preset time, the squadrons will get a bill for the number of gallons of fuel received.

SUMMARY

In this chapter, you have learned about the equipment and procedures used in flight deck fuels operations. As with below decks operations, following proper procedures is a must. The flight deck of an aircraft carrier is one of the most exciting and dangerous places to work. All flight deck supervisors should ensure new personnel receive in-depth training on flight deck hazards. Knowing your equipment, knowing the correct operating procedures, and always being aware of your surroundings will keep you alive!